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IN TWO SECTIONS

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## EDITORIAL DEPARTMENT NOTE

At the present time there is evident a great increase in interest in the subject of inventory valuation. We have heard much lately about the normal stock method, the last-in, first-out and other methods designed to exclude inventory profits, at least partially, from reported income and to prepare against the inevitable inventory losses which will come with the next sizable drop in material prices if conventional methods of inventory valuation are followed. In the first article in this issue of the Bulletin we are pleased to present a suggestion for another line of attack on this problem; a suggestion for segregating inventory gains and losses and informing management of the sources of gains and losses so that intelligent action can be taken with respect to them.

The author of this article is Clarence B. Nickerson, who was graduated from the College of Business Administration of Boston University in 1928 and from the Harvard Graduate School of Business Administration in 1930. Upon his graduation from Harvard he joined the Accounting Department of the School to do research work in the field of accounting and to aid in the development of case material for teaching purposes. He is now Assistant Professor of Accounting at Harvard. Professor Nickerson is at present Director of Program for our Boston Chapter.

Our second article relates to a somewhat different field, but one in which the cost accountant is greatly interested. In this article is presented a plan for the comparative valuation of the various occupations in a particular company or industry. The author outlines a suggested method to be followed in making such a comparative evaluation and illustrates the practical application of the method described. The author of this article is W. W. Finlay, who was educated in London and graduated from the London College of Engineering and Navigation. After being invalided from the Royal Navy, he turned his attention to industrial engineering and was engaged for some years in the Manufacturing Division of the Singer Mfg. Co. He continued his industrial engineering experience in this country with the American Can Co. and the Worthington Pump and Machinery Corp. as Time Study Engineer. He then joined the American Cirrus Engine Co. as Manager of Production Control, and later became Cost Accountant and Assistant Treasurer. For the last seven years, Mr. Finlay has been with the Wright Aeronautical Corp., first as Production Engineer and later as Manager of License and Export. He is at present Director of Publications for our Newark Chapter.

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OCTOBER 1, 1937

# INVENTORY VALUATION—THE USE OF PRICE ADJUSTMENT ACCOUNTS TO SEGREGATE INVENTORY LOSSES AND GAINS

**By Clarence B. Nickerson, Assistant Professor of Accounting, Harvard Graduate School of Business Administration, Boston, Mass.**

WITHIN the last two years considerable interest has developed in problems of inventory valuation. In part this is due to a more widespread appreciation of the inherent difficulties in valuation and of the significant effects that differences in inventory valuation can have on stated assets and stated profits. However, it is probable that rising prices, with their concomitant inventory profits, and income tax considerations, in particular the undistributed profits tax, have been the major causes of this revival of interest.

There has been much discussion of the normal stock method and its near relations and several companies have fairly recently joined the ranks with those who have used such methods for many years.

*Suggested Method Compared with "Ideal" Standard Costs*

In addition to the tax considerations there appears to be a growing conviction that during the upswing of prices and prosperity there should be in some manner a clarification of the sources of stated profits and provision for expected inventory losses. In this connection, and because the threat of substantial inflation has by no means disappeared, it is of some interest to study methods used in Europe during the periods of inflation following the World War when companies wished to have a clearer understanding of the nature and sources of their profits. It is the purpose of this article to describe and comment upon one such method which involves the use of what amounts to "ideal" standard costs as practiced in the U. S. A., assuming that the standard costs are adjusted at frequent intervals in line with current costs. The method differs from our practice to some extent in technique, but the major difference lies in the treatment of the price adjustments or variations between actual and standard costs. In our country

it appears to be common practice to close such variations to the cost of goods sold account at the end of an accounting period and not to show them at all in the published financial statements. Under the method to be described it appeared to be common practice to carry forward from one accounting period to another the balances in the adjustment accounts with the result that credit balances were built up as prices rose, representing the reservation of inventory gains, and these were used to absorb losses as prices fell, leaving the stated profits or losses as clear of inflationary profits and losses as was practicable. Before discussing the differences further it will be well to present a brief description of the method.* Typical ledger accounts are presented to aid the description.

The use of replacement costs is one of the most important features of the method. Raw material enters production not at actual cost but at replacement cost. Goods completed are entered in the finished goods account at their replacement cost as of the time of completion. The cost of goods sold is taken to be their replacement cost as of the time of sale. Assuming that finished goods prices bear some relation to replacement costs the resulting gross profit is considered to be the manufacturing gross profit. Losses and gains from price fluctuations are segregated in special accounts.

*Recording Raw Material Entering Process*

Material is entered in the raw material account at actual cost including freight and a charge for material overhead, (purchasing, accounting and storing). It is credited out for production at its average cost and a corresponding debit is made to a raw material price fluctuations account. At the same time it is entered in a work-in-process account at its replacement cost, including a percentage for freight and material overhead, and a corresponding

* The information presented here was obtained through the kindness of Professor Henrik Schybergson of the Swedish Collegiate School of Business; Mr. Raynor Liljeblad of Allmanna Svenska Elektriska Aktoebolaget; the executives of A. B. Svenska Tobaksmonopolet. The description of the method has been adapted from a section of the author's thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Commercial Science at the Graduate School of Business Administration of Harvard University.

PRICE FLUCTUATION ACCOUNTS — INVENTORY ACCOUNTS

*Raw Material*

| | |
|---|---|
| Enter material at purchase price plus freight and a charge for material overhead. | Credit out at average cost. |

*Raw Material Price Fluctuations*

| | |
|---|---|
| Enter at average cost from Raw Material Inventory Account. | Credit at replacement cost including a % for freight and material overhead. |

*Work in Process*

| | |
|---|---|
| 1) Enter at replacement cost including a % for freight and material overhead.<br>2) Actual labor.<br>3) Overhead. | Credit out at same price when completed.<br>1) Replacement cost of material *at time it entered production.*<br>2) Actual labor.<br>3) Proper share of overhead. |

*Work in Process—Price Fluctuations*

| | |
|---|---|
| Enter at price credited to Work in Process. | Credit out at replacement cost of material, labor and overhead *at time of completion.* |

*Finished Goods*

| | |
|---|---|
| Enter at price credited to Work in Process Price Fluctuation Account. | Credit out at same price when sold. |

*Finished Goods—Price Fluctuations*

| | |
|---|---|
| Enter at price credited to Finished Goods. | Credit out at replacement cost of material, labor and overhead *at time of sale.* |

*Cost of Goods Sold*

| |
|---|
| Enter at price credited to Finished Goods Price Fluctuations Account. |

credit is made to the raw material price fluctuation account. This price fluctuation account thus absorbs the difference between the average cost of the material and its replacement cost at the time it enters production. Though the use of replacement cost is a fundamental concept, as a practical matter minor fluctuations in the market are ignored. A list of standard prices is prepared for all materials corresponding to the frequently adjusted or "ideal" standard costs used in the United States. This list is in effect a list of current market prices standardized to the extent of avoiding minor fluctuations of the market. When market prices have deviated sufficiently from the standard prices a new list of standard prices has to be made which subsequently is followed until it is time to make a new list of standard prices again.

In addition to raw material at replacement cost the work-in-process account is charged for actual labor expended, and either actual overhead or overhead absorbed through standard burden rates, depending upon the cost accounting system in use.

*Accounting for Goods Completed*

Goods completed are credited out of the work-in-process account at an amount as determined by the cost accounting records which represents a proper share of the material, labor, and overhead charged to that account. A corresponding debit is made to a work-in-process price fluctuations account. At the same time they are entered in a finished goods account at their replacement cost as of the time of completion and a corresponding credit is made to the work-in-process price fluctuations account. This price fluctuation account thus absorbs the difference between the costs charged to goods during their production and their replacement cost at the time of completion. Practice varies as to whether replacement cost is computed at this point for material alone or for all of the elements of cost, that is, for material, labor and overhead. In either case, use is made of lists of standard prices as described for raw material above.

*Accounting for Cost of Sales*

Goods sold are credited out of finished goods at the same price at which they entered that account. A corresponding debit is made to a finished goods price fluctuations account. At the same

time they are entered in a cost of goods sold account at their replacement cost as of the time of sale and a corresponding credit is made to the finished goods price fluctuations account. This price fluctuation account thus absorbs the difference between the cost of the goods as determined at the time of their completion and their replacement cost at the time of sale.

Practice likewise varies here as to whether replacement cost is computed for material alone or for material, labor, and overhead. In some cases replacement cost is figured at this point for material, labor and overhead even though computed for material alone at the time goods enter the finished goods account.

*Treatment of Balances of Price Adjustment Accounts*

The information received regarding the method did not indicate a uniform treatment of the balances remaining in the price adjustment accounts. It appears to be left to the discretion of the management as to whether they are to remain in the books or be closed entirely or in part to the profit and loss account. It is known that in one company balances were allowed to accumulate in these accounts when prices were rising, which enabled them to absorb losses when prices fell without bringing either the gains or the losses into the stated profits.

Since the method requires the use of additional accounts and the calculation of replacement cost for goods in their various stages, it would appear to be more costly to operate than ordinary methods. The only information received on this point is that in one company the method was adopted without any increase in the personnel.

COMMENTARY

*Application of Material Overhead*

Under this method raw material is entered in a raw material account at cost including freight and a percentage of the purchase price to cover material overhead. Presumably the percentage figure would be the percentage of total material overhead to total purchases for the previous year. This is not a sound procedure for it makes the overhead charged dependent upon the purchase price and when prices are changing rapidly the amount charged would also change, though material overhead in fact

remains relatively fixed. It would be preferable, when the inventory consists for the most part of a few bulky raw materials, to establish charges per 100 pounds or per ton by dividing the normal material overhead by the normal quantity purchased. The material overhead under- or over-absorbed could then be broken down to its cause, which would be due partly to a change in volume purchased and partly to a change in the overhead expense itself. However, if this material overhead is charged to the raw material account it must be credited out when raw material enters production and appears to complicate the problem unnecessarily. It is suggested that to simplify matters it could well be included in general overhead and worked into the burden rates charged to goods being manufactured.

*Developing Standard Prices*

The use of lists of standard prices is a sensible procedure but the conditions under which new lists are to be prepared should be set forth and followed consistently. A weighted index, weighted that is, by the quantity of each item of raw material purchased in the previous year, should be used to follow the trend of prices. To simplify the computation of the index number, minor items of material and fabricating supplies which do not represent altogether more than 10 per cent of the total material cost should be omitted from the index. An index number should be computed once each week, using average prices for the week and weighing them as indicated above.

It should be decided in advance as to just how much of a change in the index represents a sufficient deviation requiring the preparation of a new list of standard prices. This would require study and experimentation the problem being to recognize significant changes and yet to avoid the frequent preparation of new lists. Except in periods of extreme price changes it should be unnecessary to prepare more than an average of one new list per month and probably four new lists per year would be sufficient.

*Application of Prices Under Job and Process Plans*

The question may well be raised as to just how and when the list prices are to be applied to the goods in their various stages. This depends upon the type of cost accounting system in use and

in general it may be said that as far as materials are concerned replacement cost will be computed in the same manner and at the same time as actual costs.

Under job order costing each job is charged with materials at the time they are withdrawn from stores. Material can be withdrawn only on the basis of requisitions properly authorized. These requisitions are priced by the stores clerk or cost accounting department and it should not be too great a task to include the replacement cost in addition to the actual cost. These requisitions would then represent the basic data for charges to jobs on job order cost sheets and for journal entries in the books of account. When a job had been completed the quantity of materials used could be repriced according to the list then in use. Since the job order cost sheets would then show the costs charged at the time material entered the jobs and the replacement cost of the material at the time the job was completed, they would provide the basic data for journal entries to transfer the total work completed for a period out of the work-in-process account, through the work-in-process price adjustment account and into the finished goods account.

Under process costing, material requisitions would be used as described above to account for the actual cost and replacement cost of material entering production. At the close of the month the charges to work-in-process would be apportioned to work completed and work remaining in process in the same manner as when actual costs are used. Journal entries would be made, crediting the work-in-process account and debiting the work-in-process price adjustment account for goods completed. A daily record of production would be kept in which goods would be priced according to the list in effect on the date of completion. A monthly summary of the daily records would provide the data for a journal entry, crediting the finished goods price adjustment account and debiting the finished goods account. In pricing goods completed the shrinkage factor should be allowed for. This would be a troublesome matter to be solved only in the light of particular circumstances. As a suggestion, the list price could be a price per completed unit taking into account the normal quantity used and the normal shrinkage. The work-in-process price adjustment account would then absorb the variation between the actual and

normal quantity used and the variation between the actual and normal shrinkage.

Sales records would show the daily sales and the management would probably wish to have the replacement cost of sales computed daily or weekly in order to note the returns from current sales over and above replacement cost. For the purpose of journal entries, however, if list prices had not changed it would only be necessary to summarize the sales for the month by types of product and compute the replacement cost for the totals. If list prices had changed during the month it would be necessary to summarize the sales from the beginning of the month to the day on which the list was changed and to price those totals using the old list. The sales for the remainder of the month would be totaled and priced from the new list.

*Use of Replacement Costs for Labor and Overhead*

Whether or not the replacement cost should be computed for labor and overhead depends considerably upon the ease with which this can be accomplished and the amount of information management desires and is willing to pay for. To go back over every hour of labor spent on a job and compute its replacement cost, and to re-compute every burden charge would involve a tremendous amount of work which would be unwarranted because of the small value to the management of the results obtained.

List prices could be prepared for each type of product which would represent the standard hours of labor to produce the item at replacement cost, and standard burden charges per type of product at replacement cost. This would result in pricing the finished goods at "ideal" standard costs and would leave variations in the work-in-process price fluctuations account not only for price but for efficiency as well. That is, if labor costs had gone up the labor element would be credited out of the price fluctuations account presumably at a higher figure than it entered that account, but if it had taken much longer to complete the product than was customary, the actual amount charged to that account might be much larger than the credit (the credit being the list price, which assumed a standard number of hours for completing the product).

Since wage rates are not subject to such a marked degree of fluctuation as are materials, and since a change in them is not quickly reflected in the finished goods market prices, it would be just as well to use actual labor costs throughout the method described in this case. This would also simplify the procedure.

It is recommended that overhead be charged to work-in-process through standard burden rates and that after a product has been thus charged no recomputation be made. The standard burden rates should be reviewed quarterly and adjusted if they appear to be unsatisfactory in the light of developments which have taken place since they were originally established.

*Reduction of Inventories to Cost or Market*

The use of replacement cost results in writing up the inventories other than raw material when prices are rising. It is recommended that for balance sheet purposes these inventories should be valued at the lower of cost or market and that the adjustments necessary to bring this about should be charged to the price fluctuations account. At the start of the new period the adjustments should be reversed to bring the inventories back to replacement cost for accounting purposes during the new period.

*Price Fluctuations as Separate Profit and Loss Item*

Except under extreme inflation it would appear preferable to bring gains and losses from price fluctuations into the income account as a separate item. The profit and loss statement could then be prepared showing the operating profit with the cost of goods sold at replacement cost, to which would then be added the inventory gains or from which the inventory losses would then be subtracted. If those who are interested in a business know just how much these losses and gains are they can draw their own conclusions, but a profit and loss statement without them is just as misleading as one which does not indicate how much they are. Having stated the inventory gains, management could then treat them as they saw fit. For example, they might wish to transfer them to a special surplus account unavailable for dividends in which they would be retained to take care of the inevitable inventory losses. When these losses came they would likewise be run through the

profit and loss account and thus affect the final stated profit, after which they would be transferred to the special surplus account.

*Possible Simplification*

The method could be simplified and used in connection with the valuation of inventories at the lower of cost or market. The following suggestions indicate how this could be done.

Only one price fluctuation account need be used, namely, that for finished goods. Inventories of raw material, work-in-process, and finished goods should be valued at the lower of cost or market at the close of the period and the adjustments, if any, necessary to bring them from cost to market should be carried directly to the profit and loss account. Raw material used should be transferred to the work-in-process account at actual cost (the actual cost for any material on hand at the beginning of the period being the lower of cost or market at that time).

So too, goods completed should be transferred from work-in-process to the finished goods account at actual cost. The actual cost of goods should then be transferred from the finished goods account to the finished goods price fluctuations account. The latter account should then be credited for the replacement cost of the goods sold, and the cost of goods sold account should be debited for the same amount.* The balance in the finished goods price fluctuations account should then be closed to the profit and loss account. The exact method of closing the cost of goods sold and sales accounts will depend upon the particular practice of the given company; suffice it to state here that eventually the gross margin based on reproduction cost will be brought into the profit and loss account.

*Simplified Method Illustrated*

This method would have substantially the same advantage as the method described in the case and would be much simpler to operate. Typical accounts and pro forma profit and loss statements are presented below.

* Replacement cost is meant here to consist of the replacement cost of material, the actual cost of labor, and burden absorbed, as recommended on page 158.

Raw Material
1) Opening inventory at lower of cost or market as at close of previous period
2) Purchases at cost
1) Transfer out at average cost
2) Adjustment, if necessary, in valuing the closing inventory at the lower of cost or market
Work in Process
1) Opening inventory at lower of cost or market at close of previous period
2) Raw material
3) Actual labor
4) Overhead absorbed
1) Transfers out bearing a proper share of the charges to this account as determined by the cost accounting records
2) Adjustment, if necessary, in valuing the closing inventory at the lower of cost or market
Finished Goods
1) Opening inventory at lower of cost or market at close of previous period
2) Goods completed during the period at value transferred from Work in Process
1) Goods sold are transferred out of this account at the same value as when they entered it.
2) Adjustment, if necessary, in valuing the closing inventory at the lower of cost or market
Finished Goods Price Fluctuations Account
1) Enter actual cost of goods sold as transferred from the finished goods account
1) Credit goods sold at same price for labor and overhead as charged to this account but use replacement cost for material
Close out balance to Profit and Loss
To Profit and Loss Account
Gross Profit can then be computed with Cost of Goods Sold at replacement cost.

INVENTORY RESERVES - COMMENTARY

A. CONDENSED PRO FORMA PROFIT AND LOSS STATEMENT UNDER CONDITIONS OF RISING PRICES

(*Assuming actual cost of goods sold to be* $335,000)

| | | |
|---|---|---|
| Net Sales | | $500,000 |
| Cost of Goods Sold (Material at replacement cost) | | 350,000 |
| Gross Profit | | $150,000 |
| Administrative Expense | $25,000 | |
| Selling Expense | 70,000 | 95,000 |
| | | $ 55,000 |
| Burden Over Absorbed | | 5,000 |
| Profit from Rising Prices (Representing realized inventory profit as measured by the difference between the actual cost and replacement cost of material in goods sold | | 15,000 |
| Net Operating Profit | | $ 75,000 |

B. Under present practice a condensed statement for the same period would appear as follows (Cost of Goods Sold being at actual cost less burden over-absorbed):

| | | |
|---|---|---|
| Net Sales | | $500,000 |
| Cost of Goods Sold | | 330,000 |
| Gross Profit | | $170,000 |
| Administrative Expense | $25,000 | |
| Selling Expense | 70,000 | 95,000 |
| Net Operating Profit | | $ 75,000 |

C. CONDENSED PRO FORMA PROFIT AND LOSS STATEMENT UNDER CONDITIONS OF FALLING PRICES

(*Assuming actual cost of goods sold to be* $350,000)

| | | |
|---|---|---|
| Net Sales | | $500,000 |
| Cost of Goods Sold (Material at replacement cost) | | 335,000 |
| Gross Profit | | $165,000 |
| Administrative Expense | $25,000 | |
| Selling Expense | 70,000 | 95,000 |
| | | $70,000 |
| Burden Un-absorbed | $ 5,000 | |
| Loss from Falling Prices (representing realized inventory loss as measured by the difference between the actual cost and replacement cost of material in goods sold) | 15,000 | |
| Inventory Adjustment (Representing the loss taken by writing down inventories on hand to replacement cost) | 5,000 | 25,000 |
| Net Operating Profit | | $ 45,000 |

D. Under present practice a condensed statement for the same period would appear as follows (Cost of goods sold being the actual cost of $350,000; plus the inventory write-down of $5,000 under valuation at the lower of cost or market; plus the burden unabsorbed of $5,000):

| | | |
|---|---|---|
| Net Sales | | $500,000 |
| Cost of Goods Sold | | 360,000 |
| Gross Profit | | $140,000 |
| Administrative Expense | $25,000 | |
| Selling Expense | 70,000 | 95,000 |
| Net Operating Profit | | $ 45,000 |

These profit and loss statements are over-simplified but they do indicate that under the proposal the reader would be given a more definite picture of the nature and sources of the net operating profit. Essentially the proposal is simply an adaptation of standard costs carried into the financial records and statements. Having established the amount of the realized inventory gain, and given full disclosure to this important item, all or such part of it as the management deemed advisable, could be reserved to cover inventory losses realized in the future and given equally full disclosure. As far as net profits available for dividends or justifiably subject to taxation are concerned the result could be just the same as under the normal stock method. The method would differ from the normal stock method, however, in that the reserve would be stated instead of hidden; the inventories would be carried at their debt paying ability (cost or market whichever is lower) rather than in the large part at low fixed prices; and full disclosure would be given to inventory gains and losses instead of eliminating from the financial statements the price gains and losses on the normal stock.

*Conclusion*

The methods illustrated are not panaceas but they have been presented in the hope that they may stimulate further thought and discussion on the problems of inventory valuation. The technique is not of paramount importance. Regardless of any given method of accounting the growing recognition of the ephemeral character of inventory profits and the desire to make provision for inventory losses are healthy signs. Certainly traditional practice can be improved, first, by the clarification of stated profit so that among

other things stockholders and management will know to what extent the profit has been affected by inventory gains and losses, and second, by more careful consideration and provision of inventory reserves during periods of rising prices to protect surplus from the inevitable losses when prices fall.

Traditional practice has been based on a short run view of profits and has been dominated by balance sheet considerations. The normal stock method involves a long range viewpoint of profit and in its extreme form makes the balance sheet subservient to the statement of profit and loss. Some companies have adopted methods which improve traditional practice and include certain of the desirable features of the normal stock method.* The extension of standard costs to the financial records and statements along the lines suggested in the present article offers possibilities in this direction.

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* See "The Base-Stock Principle in Income Accounting." Ross G. Walker, Harvard Business Review. Vol. XV, No. 1. Autumn Number, 1936, p. 76.

# COMPARATIVE EVALUATION OF OCCUPATIONS IN INDUSTRY

**By W. W. Finlay, Manager of License and Export, Wright Aeronautical Corp., Paterson, N. J.**

DURING the last ten or fifteen years there has been slowly growing in American industry a feeling that a sound basis for establishing wage rates would be highly desirable as a tool of management. This feeling, we now know, was co-incidental with a definite change in the relations between employee and management.

Today, American industry finds itself faced with the necessity of meeting in a practical fashion many problems which, if they had thought of them at all before, they merely regarded as problems of purely academic interest.

It has become apparent that wage rates in any particular factory or industry are not necessarily proportional, one to the other, in terms of the value of the work performed under the various functions or accupations; and further, in the majority of cases much misunderstanding exists as to what are the actual occupations required in a particular industry and also what is the true definition and scope of these occupations.

A considerable amount of unrest and dissatisfaction among employees can be directly traced to a feeling that no sound basis is used for the determination of wage rates. An employee feels just as badly if, in his opinion, an occupation is being over-remunerated as compared with his own as he does when he feels that his own occupation is being under-remunerated.

In the past when dissatisfaction became acute or when outside pressure was brought to bear, an adjustment would be made in an emolument rate probably by a compromise or by a so-called "judgment of the case upon its merits." After a period of operating under these conditions, a situation arises in which the wage rates for different occupations are definitely inequitable and bear no definite relation to each other on the basis of their value to the organization.

The following method of meeting this problem has been used, either in part or in whole, in a number of modern factories. The

figures used as illustrations are naturally arbitrary and are not taken from any specific case. This has been done not so much because of the undesirability of using actual figures, but more because there is always a danger when specific experience in such a matter as this is published, that others desiring to use the method described are unduly influenced by the illustrating figures and consequently do not give full consideration to the particular conditions that they are trying to meet in their own organization or industry.

*Approach to the Problem*

A comparative evaluation of an occupation that is basic can only take into account the inherent demands and characteristics of that occupation and should not include as a varying influence, supply and demand, rates already in existence in the particular organization or in the general locality, or any other outside influence on the emolument rate. It should be pointed out here that while it is recognized that such influences are definitely in existence and will no doubt effect to some extent the final wage rates established, they are nevertheless not part of the basic value of an occupation.

One of the important things to be considered when attempting a job of this kind is to determine who should do the work of making the evaluation. That is a question that can only be answered by the circumstances involved, but it is suggested here that the most desirable individuals to establish such a comparative evaluation are those in the organization who control the employees that will eventually be affected by it. That is to say, it is most desirable that this work be accomplished by a committee composed of the supervisors of the hourly wage employees in the organization. There is another good reason for this that will be touched upon later.

Having determined the individuals who will actually carry out this work, the next step is the compiling of a complete list of the occupations to be evaluated with a simple definition of each occupation. It is suggested that a very excellent line of demarcation to be drawn between those occupations involved in the evaluation and those not so involved, is to confine one's first efforts in this direction to all of those occupations paid on an hourly rate.

Having accomplished this preliminary but highly essential part of the job, it is now necessary to get down to the serious business of determining those factors that clearly define the value of an occupation.

It is felt that as a reasonable basis from which to work, the value of an occupation can be broken down into three main headings:

1. *Previous training.*

   This division should cover the requisite schooling and working experience in order to fit an individual for work in a particular occupation.

2. *Inherent demands of an occupation, peculiar to the industry or factory under consideration.*

   This division covers such things as the skill required, accuracy demanded, as well as ingenuity and integrity characteristics.

3. *Physical conditions under which the work of an occupation is performed.*

   This division rather obviously covers health and accident hazards, dirty conditions, physical effort, etc.

*Determining Comparative Importance of Main Headings*

The mental approach to this stage must be purely objective and every effort should be made to keep those who are working at such a scheme of job evaluation, from adopting the subjective point of view. The determination of the importance of these headings in relation to each other must be done by a broad visualization of the conditions applicable to the organization under consideration and the greatest care must be exercised not to allow a narrow consideration of specific instances and specific individuals on minor problems to influence the minds of those engaged in this work.

To illustrate, let it be supposed that the comparative importance in these major divisions is as follows:

| | |
|---|---|
| 1. Previous training | 50% |
| 2. Inherent demands | 40% |
| 3. Physical conditions | 10% |
| | 100% |

The above figures might represent the opinion of the evaluating committee in the case of a high-grade machine shop or instrument factory, whereas on the other hand if this work were being done for a steel mill, obviously much greater importance would be attached to the third division of physical conditions and possibly less to each of the other two.

To attempt the evaluation of occupations in terms of the above three main divisions would be most difficult and probably not very effective, so in order to arrive at a somewhat more subjective viewpoint, the main heads should be sub-divided into a number of factors. It is suggested that the following breakdown would be applicable to a wide variety of manufacturing concerns:

1. *Previous training:*
   a. Education required
   b. Time required to learn the trade
2. *Inherent demands:*
   a. Ingenuity
   b. Skill and accuracy
   c. Time to adapt skill to occupation
   d. Cost of probable errors
   e. Honesty of effort
3. *Physical conditions:*
   a. Health hazard
   b. Accident hazard
   c. Dirtiness of working conditions
   d. Physical effort required
   e. Monotony

The next step in this task is one of extreme importance and again must be approached objectively. This step is the application of the proper index values to each of the factors enumerated

above. It has already been determined that the main division covering "previous training" represents 50 per cent of the whole in importance. Therefore the two factors under this heading between them obviously represent this 50 per cent. It is now necessary to determine in what proportion, in terms of their importance, these two factors should share this 50 per cent.

The same process applies to the other two divisions, that is to say the factors should receive an index figure that will represent, in the case of the second division, a breakdown of 40 per cent and in the case of the third division a breakdown of 10 per cent.

This can only be accomplished by a calm and dispassionate visualization of the conditions under which the occupations operate. Using the same hypothetical evaluation as was used above, the following breakdown into index figures is suggested:

| | | |
|---|---|---|
| 1. *Previous training:* | | |
| a. Education requirements | 15 | |
| b. Time to learn trade | 35 | |
| | 50 | |
| 2. *Inherent demands:* | | |
| a. Ingenuity | 7 | |
| b. Skill and accuracy | 15 | |
| c. Time to adapt skill to occupation | 9 | |
| d. Cost of probable errors | 5 | |
| e. Honesty of effort | 4 | |
| | 40 | |
| 3. *Physical conditions:* | | |
| a. Health hazard | 2 | |
| b. Accident hazard | 2 | |
| c. Dirtiness of working conditions | 1 | |
| d. Physical effort required | 4 | |
| e. Monotony | 1 | |
| | 10 | 100 |

*Definition of Factors*

Having determined the factors and their index of comparative importance, it is essential that the committee have available for their guidance a definition of each of the factors. These definitions are as follows:

1. *Education requirements:*

The amount of schooling it is felt to be necessary in order to fit an individual for the requirements of an occupation is an investment on the part of the individual, and therefore definitely becomes a factor of value to his employer. Consequently, in determining a comparative value of one occupation to another, the amount of school training must be considered.

Occupations under this factor should be weighted by taking into account the requisite schooling, covering primary, secondary and high school courses, vocational and mechanical arts courses, and possibly college.

2. *Time to learn trade:*

This factor recognizes that the time spent in learning a trade and gathering working experience to the point of being recognized as a first-class operator in the occupation, is an investment on the part of the individual and the greater the investment made, the greater the value to the company employing that individual, assuming that the occupation in which he is employed has a definite use for this skill and experience.

Occupations under this factor can usually be weighted by using a time period as a yard stick. However, it must be borne in mind that there can be cases where there is a variation in the value of experience background for any given unit of time.

3. *Ingenuity:*

This factor deals with the extent to which an occupation demands the meeting of new problems, and obviously the occupation that requires a continuous application to cope with various problems demands a higher intelligence than an occupation not so constituted.

The method of judging the comparative value of an occupation from this point of view could be described as follows:

Ingenuity is mental dexterity and should be measured entirely according to the requirements of the occupation in terms of the frequency that the individual engaged in such occupation is called upon to meet and overcome definite and difficult problems. Repetition of the same problem eliminates the requirement of ingenuity. The availability of written or oral instruction in the performance of a task or in the meeting of any problem obviates the necessity for the application of ingenuity.

4. *Skill and accuracy*

It will be found that this factor presents considerable difficulty in the weighting of various occupations. The committee engaged on the work of evaluation must hold a very clear picture of the scope of this factor before them while performing their task. This factor can probably be best defined as follows:

Skill is the manual dexterity required to perform work and should in no way be confused with the mental dexterity that is a definite part of a highly skilled trade. A highly skilled worker can rate high in the occupation for which he is trained without having to apply a high degree of manual dexterity. On the other hand, an occupation may call for a high degree of specialized skill, which skill it is possible to instill into a comparatively untrained individual by concentrated training. The portion of this factor dealing with skill should be weighted directly in proportion to the amount of manual dexterity required, irrespective of the amount of training necessary. Manual dexterity should have no relation to the size of the material handled, but should be adjudged according to the physical co-ordination required.

Accuracy is the fineness of the work to be produced, adjudged according to the material to be fabricated and the positive type of tools supplied—(cutters, gages, machine equipment, etc.) relative to the allowable size limits in fabrication.

The matter of individual judgment necessary to arrive at a size is an important point to be used in considering this factor but it should in no way be confused with the judgment and decision that must be considered in the factor covering ingenuity.

It would be quite practical in such a plan of evaluation as described in this article to split this factor into its two respective portions, namely, "skill" and "accuracy."

5. *Time to adapt skill to occupation:*

Since each factory organization has its own peculiar standards with regard to the handling of material in the shop, methods of dispensing tools and supplies, and the quality in the work to be done, it takes a measurable amount of time for a new operator to adapt his already acquired skill to a new environment. This period of adaptation, that is to say, the time it takes a new operator to produce a full normal quota of work in his particular occupation, is an investment by the employer, which investment should be protected. While the actual time taken in the various occupations to adapt a normal first-class operator's skill to the work of that occupation could be used as a definite comparative yard stick, nevertheless, quite obviously, there will be a variation in the value of that time and such values should be taken into account when weighting occupations under this factor.

6. *Cost of probable errors:*

The responsibility placed upon an individual to guard against financial loss to his employer due to error in the line of duty, is a demand for carefulness on the part of the employee, which may have a very definite effect upon his relative value to the employer.

The weighting of occupations under this factor should be approached in two distinct steps:

(a) The probability of preventative errors occurring in the normal process of work while using reasonable care under the conditions of the specific occupation.

(b) The ultimate financial loss to the employing company resulting from these errors.

Here it should be carefully noted that there is a big difference between the probability of error and the possibility of error. It is difficult to visualize an occupation that does not have some possibility of expensive error, but this factor is only concerned with the inherent probability.

The opportunity for willful damage and the non-exercise of reasonable care should not be allowed to influence the decisions in the weighting of occupations under this factor. Also, the inherent probability or possibility of error in any occupation that it is outside the control of the operator to prevent, should not be con-

sidered. Obviously one would not remunerate a man with the expectation of his preventing something he cannot prevent.

7. *Honesty of effort:*

Dependency that must be placed upon the integrity and honesty of effort of an employee is a demand upon his moral virtues.

In terms of this factor occupations should be weighted in proportion to the employer's inability to measure honesty of effort with respect to any given occupation.

Types of occupations difficult to measure are those in which:

(1) The outward appearance of work being performed does not necessarily mean accomplishment.
(2) The work to be performed is too distant or is in too great a variety of locations for constant supervision.
(3) It is not practicable to apply definite time standards.

8. *Health hazard:*

Consideration in weighting occupations under this factor should be given to such conditions as the breathing of dust laden atmosphere, exposure to dampness, changes in temperature, etc., that are definitely inherent characteristics of the occupation.

9. *Accident hazard:*

The weighting of occupations under this factor is somewhat more difficult than at first appears. The severity probability and the frequency probability must both be considered. An occupation in which both the frequency and severity accident probability is high would obviously weight very high. The general tendency for those who consider this factor is to place the greater importance on the severity probability. The method of weighting should then be to grade the occupations in terms of accident severity probability and then weight them in their grade according to the frequency probability.

10. *Dirtiness of working conditions:*

Some occupations have an inherent condition of dirt, oil, dust, etc., that causes considerable discomfort to the people engaged in such occupations and therefore it is natural that inducement be

offered by the employer to engage in such an occupation. The necessity for this inducement naturally has an effect upon the comparative value of the occupation.

11. *Physical effort required:*

This factor recognizes the perfectly human trait of avoiding the expenditure of physical effort. Therefore, an occupation that demands considerable physical effort does represent a greater value in comparison with the other occupations.

12. *Monotony:*

While this factor does not have an important bearing on the final evaluation, it, of itself, presents an interesting problem in mental approach. At first thought, a highly repetitive task, for example, an occupation that involved drilling one hole in the same piece, one hundred pieces an hour, with no change whatsoever, would appeal to the committee doing the work of evaluation as an extremely monotonous job and should be rated very high in this factor. This would be a mistake because the committee would be looking at such an occupation from the point of view of their own reaction should they personally be engaged in the occupation, and obviously, being men with responsible positions, they are not the type of person who would be satisfied with a monotonous or repetitive job. The type of occupation described above is rarely hard to fill, and further it is rarely hard to keep people in the occupation. There is no scarcity of labor for the highly repetitive type of job and furthermore a study of the psychology of people engaged in such occupations has convinced the writer that they like it.

The credit for monotony in the value of an occupation should only be given where there are, as inherent characteristics of the occupation, monotonous or dull repetitive periods during the carrying out of the functions of the occupation and where the occupation demands the type of operator who, because of the intelligence required of him, would find these monotonous periods very irksome.

*Weighting of Occupations by Factors*

In the interest of consistency, it is suggested that during the process of making an evaluation of occupations, that the evalu-

ation be only in terms of the requisites for first-class operators in these occupations.

The job of weighting each occupation in terms of each separate factor is a long and arduous one and those engaged in it must be prepared for many hours of careful thought and open discussion. However, the final results obtained more than justify the effort involved.

Each factor should be considered and the occupations visualized in terms of that factor. It is suggested that a workable method to accomplish this weighting process is to decide first of all on the occupation that has the highest requisite in the particular factor under discussion and to weight this factor to. Then immediately switch to the other end of the scale and determine that occupation which rates least in terms of that factor and weight it with a small fraction or, as is very often the case, when an occupation or occupations are found where that particular factor does not enter into its requirements, the weighting should be zero.

Having determined the two extremes, each of the other occupations should be weighted in terms of the factor proportionately to these two extremes. For example, under the factor, "time to learn the trade," it would probably be logical to say that the occupation of pattern maker would rank highest and therefore would be weighted 10. It would be equally logical to say that the yard laborer would rank zero, such an occupation requiring no previous training of any sort.

When considering, for example, the occupation of milling machine operator, it might be equally logical to determine that the factor of "time to learn the trade" in this occupation is only 60 per cent as valuable to the company as that of the pattern maker, in which case this occupation would be weighted 6. Approaching it from another angle, this would mean that in the opinion of the evaluating committee the period of time that the milling machine operator spends in acquiring his skill only represented .6 of the investment that the patter maker made in himself in acquiring his skill.

This process of weighting should be applied to each occupation with each factor and at the completion of this phase of work a chart similar to the following should be compiled.

| | Education Requirement | Time to Learn Trade | Ingenuity | Skill and Accuracy | Time to Adapt Skill to Occupation | Cost of Probable Errors | Honesty of Effort | Health Hazard | Accident Hazard | Dirtiness of Working Conditions | Physical Effort | Monotony |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Indices* | 15 | 35 | 7 | 15 | 9 | 5 | 4 | 2 | 2 | 1 | 4 | 1 |
| Occupation A..... | 10 | 10 | 10 | 8.5 | 3.5 | 1.0 | 6.0 | 1.0 | 1.5 | 2.5 | 1.0 | 0 |
| Occupation B..... | 7.5 | 6.5 | 3.0 | 6.0 | 2.1 | 3.0 | 7.0 | 1.0 | 1.5 | 3.0 | 2.0 | 4.0 |
| Occupation C..... | 10.0 | 9.3 | 5.0 | 10.0 | 1.9 | 1.0 | 5.0 | 1.0 | 1.0 | 2.0 | 1.0 | 0 |
| Occupation D..... | 8.0 | 5.7 | 4.0 | 6.0 | 2.1 | .5 | 1.0 | 1.0 | 1.5 | 2.8 | 1.0 | 10.0 |
| Occupation E..... | 2.5 | 0 | 0 | 0 | .7 | .2 | 4.0 | 3.5 | 2.5 | 10.0 | 5.5 | 0 |
| Occupation F..... | 6.0 | 3.1 | 2.0 | 1.5 | 10.0 | 10.0 | 10.0 | .5 | 1.0 | 1.5 | 1.0 | 0 |

CHART 1.

Compilation of total scores with the weighting of the factors now complete, the determination of the final score for each occupation is purely a matter of simple arithmetic. By multiplying the weight of the occupation in each factor by the index of that factor, the score in points is obtained. The sum of these points for each occupation will give the total score for that occupation and a comparison between the total scores will give the relative value of each occupation. This is better illustrated in the following chart:

*Determination of Maximum Basic Rates*

Naturally the determination of the basic dollar value of labor is one of managerial policy. The foregoing demonstration of a process of determining the comparative value has produced a comparison of any one occupation to any other occupation within the scope studied, but so far has had no relation to the wage rate that might result. However, having obtained from the company management a basic policy in terms of a minimum wage rate for adult employees and a maximum wage rate for a particular occupation in a higher bracket, you will find it a simple matter to determine each of the other maximum wage rates for the occupations studied. The determination by the management of a maximum rate for one of the higher valued occupations will probably be accomplished by picking an occupation that will have a general application to other companies in a somewhat similar type of manufacture in the gen-

| | Education Requirement | Time to Learn Trade | Ingenuity | Skill and Accuracy | Time to Adapt Skill to Occupation | Cost of Probable Errors | Honesty of Effort | Health Hazard | Accident Hazard | Dirtiness of Working Conditions | Physical Effort | Monotony | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Indices* | 15 | 35 | 7 | 15 | 9 | 5 | 4 | 2 | 2 | 1 | 4 | 1 | |
| Occupation A | 150 | 350 | 70 | 127.5 | 31.5 | 5 | 24 | 2 | 3 | 2.5 | 4 | 0 | 769.5 |
| Occupation B | 112.5 | 227.5 | 21 | 90 | 18.9 | 15 | 28 | 2 | 3 | 3 | 8 | 4 | 532.9 |
| Occupation C | 150 | 315.5 | 35 | 150 | 17.1 | 5 | 20 | 2 | 2 | 2 | 4 | 0 | 702.6 |
| Occupation D | 120 | 199.5 | 28 | 90 | 18.9 | 2.5 | 4 | 2 | 3 | 2.8 | 4 | 10 | 484.7 |
| Occupation E | 37.5 | 0 | 0 | 0 | 6.3 | 1 | 16 | 7 | 5 | 10 | 22 | 0 | 104.8 |
| Occupation F | 90 | 108.5 | 14 | 22.5 | 90 | 50 | 40 | 1 | 2 | 1.5 | 4 | 0 | 423.5 |

CHART 2

eral locality and establishing a remuneration rate that is generally prevailing at that time.

Let us assume for the purpose of our chart, the following: that it has been determined that forty cents per hour is the lowest rate that will be paid to an adult employee, and that one dollar per hour is the maximum rate that will be paid to Occupation C. By plotting a curve with forty cents coinciding with zero score and one dollar coinciding with the score for Occupation C and establishing a straight line curve, we establish a chart by which all of the scores can be translated into comparative maximum hourly rates in terms of dollars and cents.

This chart will give a basic maximum rate according to the study. Obviously, in some cases there will be special circumstances, such as supply and demand, that will cause the management to modify some of the rates. However, this, in most cases, will be the exception, and as a general rule wage rates so established can be used effectively by the management as a guide in establishing equitable labor rates.

*General Comments*

The careful use and application of a plan as outlined in this article can result in better relations between management and employee. The management also has available a tool that will assist greatly in the establishment of its labor budgets and is in a much more comfortable position in the conduct of intelligent discussions and negotiations with its own employees on matters pertaining to

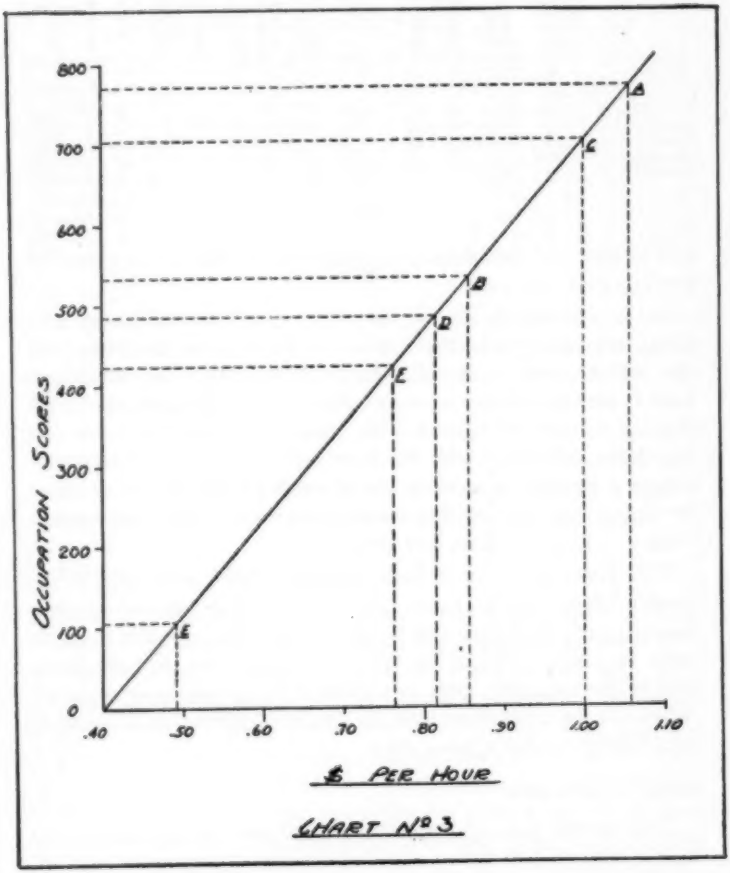
800
700
600
500
400
300
200
100
0
OCCUPATION SCORES
.40
.50
.60
.70
.80
.90
1.00
1.10
$ PER HOUR
A
B
C
D
E
F

CHART Nº 3

the equitability of the wage rates paid in that particular organization.

There is another advantage in the performance of such a job of evaluation that can be more important than the actual evaluation itself. This advantage arises from the circumstance of including in the evaluating committee foremen and supervisors who are directly concerned with the operations of the factory. The work itself gives them an opportunity to discuss openly and freely their problems, their theories and ideas, and eventually results in a broad and liberal education among the staff of supervisors that they probably could not get any other way. It is contended here that even supposing the final evaluations were never used, the job itself is worthwhile because of this advantage alone.

It is the firm conviction of the writer that the sporadic attempts being made today to find basic values for functions and occupations is merely the beginning of a very significant movement that is the result of an aggregation of constructive thought on the part of management in American industry. It is further felt that such constructive thinking is one of the healthiest indications in our modern industrial development in terms of the all important matter of human relations.

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